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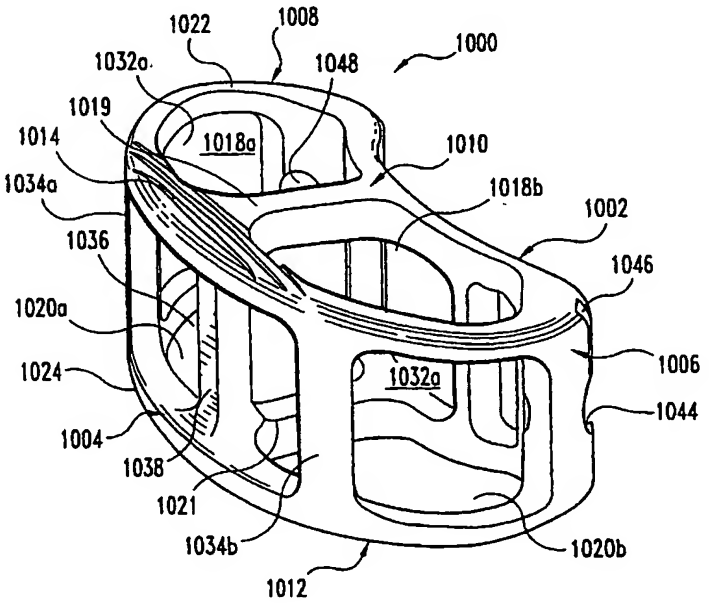
(54) Title: DEVICES AND TECHNIQUES FOR A POSTERIOR LATERAL DISC SPACE APPROACH



(57) Abstract: This invention relates to methods and instruments for performing disc space preparation and implant insertion from a unilateral approach to the spine through a posterior lateral opening to the disc space. The instruments include spreaders, distractors, reamers, scrapers, cutters, chisels, pushers and implant inserters. A surgical procedure is provided that allows bilateral support of the adjacent vertebrae with at least one interbody fusion device inserted into the disc space via a unilateral approach. Implants for insertion into the disc space are also provided.

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AMENDED CLAIMS

[received by the International Bureau on 18 September 2001 (18.09.01);
original claims 1, 8-10, 15, 17, 32 and 36 amended; original claims 2 and 38 cancelled;
remaining claims unchanged (9 pages)]

1. A spinal implant adapted for non-linear insertion in an intradiscal space, comprising:

a leading end wall;

a trailing end wall having an insertion tool engaging portion;

a posterior wall extending between said leading end wall and said trailing end wall; and

an anterior wall extending between said leading end wall and said trailing end wall, wherein said posterior wall has a height that is less than the height of said anterior end wall and said trailing end wall and said leading end wall each have a height that is less than the height of both said anterior wall and said posterior wall.

3. The implant of claim 1, wherein said posterior wall is concave and said anterior wall is convex.

4. The implant of claim 1, wherein said leading end wall and said trailing end wall have the same height.

5. The implant of claim 1, further comprising:

an upper bearing member extending between and connected to said leading end wall, said anterior wall, said posterior wall and said trailing end wall; and

an opposite lower bearing member extending between and connected to said leading end wall, said anterior wall, said posterior wall and said trailing end wall.

6. The implant of claim 1, wherein said leading end wall includes an insertion tool engaging portion.

7. The implant of claim 1, wherein said insertion tool engaging portion is an internally threaded holed formed through said trailing end wall.

8. A spinal implant, comprising:

a leading end wall;

a trailing end wall;

a posterior wall extending between said leading end wall and said trailing end wall;

an anterior wall extending between said leading end wall and said trailing end wall;

an upper bearing member extending between and connected to said leading end wall, said anterior wall, said posterior wall and said trailing end wall; and

an opposite lower bearing member extending between and connected to said leading end wall, said anterior wall, said posterior wall and said trailing end wall, wherein said anterior wall includes at least one strut positioned between openings on each side thereof, and said upper bearing member and said lower bearing member each include a cantilevered portion extending beyond said strut and said openings.

9. The implant of claim 8, wherein said openings in said anterior wall include a first anterior lateral opening adjacent said leading end wall and a second anterior lateral opening adjacent said trailing end wall.

10. The implant of claim 9, wherein:

said at least one strut includes a first vertical strut and a second vertical strut;

said first anterior lateral opening is defined between said first vertical strut, said leading end wall and said upper and lower bearing members;

said second anterior lateral opening is defined between said second vertical strut, said trailing end wall and said upper and lower bearing members; and

said anterior wall further including a middle opening defined between said first strut, said second strut, and said upper and lower bearing members.

11. The implant of claim 10, further comprising an offset strut adjacent said middle opening and offset towards said posterior wall, said offset strut extending between said upper bearing member and said lower bearing member.

12. The implant of claim 8, wherein said anterior wall has a height that is greater than a height of said posterior wall, and said trailing end wall is adapted for coupling to an insertion tool.

13. The implant of claim 8, wherein:

said upper bearing member includes an upper strut and a pair of openings on either side of said upper strut; and

said lower bearing member includes a lower strut and a pair of openings on either side of said lower strut.

14. The implant of claim 8, wherein:

said upper bearing member includes a number of grooves formed in an upper bearing surface thereof; and

said lower bearing member includes a number of grooves formed in a lower bearing surface thereof.

15. A spinal implant adapted for non-linear insertion in an intradiscal space, comprising:

a leading end wall;

a trailing end wall;

a posterior wall extending between said leading end wall and said trailing end wall;

an anterior wall extending between said leading end wall and said trailing end wall;

an upper bearing member extending between said leading end wall, said anterior wall, said posterior wall and said trailing end wall; and

an opposite lower bearing member extending between said leading end wall, said anterior wall, said posterior wall and said trailing end wall, wherein the implant has a center axis extending generally in the direction between said leading end wall and said trailing end wall, said posterior wall and said anterior wall being positioned on opposite sides of said center axis, wherein said trailing end wall and said leading

end wall each have a height that is less than the height of both said anterior wall and said posterior wall, and said anterior wall has a height greater than a height of said posterior wall.

16. The implant of claim 15, wherein said upper bearing member and said lower bearing member each include a cantilevered portion along said anterior wall.

17. The implant of claim 15, whereby said leading end wall and said trailing end wall are each offset from said center axis in the direction of said posterior wall.

18. The implant of claim 15, wherein said posterior wall is concave and said anterior wall is convex.

19. The implant of claim 15, wherein said leading end wall and said trailing end wall have the same height.

20. An assembly for non-linear insertion of a spinal implant in an intradiscal space, comprising:

an implant having an insertion tool engaging portion;

an inserter connectable to said implant, said inserter including:

an elongated shaft having an impaction tool engaging portion;

a handle at the proximal end of said shaft;

an implant connector at the distal end of said shaft engageable to said insertion tool engaging portion of said implant; and

a pusher engageable to said impaction tool engaging portion.

21. The assembly of claim 20, wherein said shaft of said inserter has a lateral offset portion adjacent the distal end of said shaft.

22. The assembly of claim 20, wherein said shaft of said inserter has a bend adjacent the distal end of said shaft.

23. The assembly of claim 22, wherein said shaft of said inserter is hollow, said inserter further including a flexible inner shaft extending through said shaft, said implant connector being coupled to a distal end of said inner shaft.

24. The assembly of claim 20, wherein impaction tool engaging portion is a notch formed around said shaft and said pusher includes a U-shaped prong positionable in said notch.

25. The assembly of claim 20, wherein said impaction tool engaging portion is a bore formed in said shaft and said pusher includes a reduced diameter distal tip positionable in said bore.

26. The assembly of claim 20, wherein said implant defines a boomerang shape in a plane generally parallel to the vertebral endplates.

27. A lamina spreader, comprising:

a first arm including a distal portion with a lamina engaging portion for engaging an upper lamina; and

a second arm including a distal portion with a lamina engaging portion for engaging a lower lamina, said second arm being pivotally connected to said first arm, said first and second arms extending generally along a first axis when in a first spreading position, wherein said first arm and said second arm are each hinged whereby a proximal portion of each arm can be rotated with respect to said distal portion of said arm to a second position transverse to said first axis.

28. The lamina spreader of claim 27, wherein said lamina engaging portions each have a U-shape.

29. The lamina spreader of claim 27, further comprising a spreading mechanism extending between said first arm and said second arm.

30. The lamina spreader of claim 27, wherein each of said first and second arms includes a manually releasable locking mechanism, said locking mechanism locking said arm in said first position and releasable to allow said arm to be rotated to said second position.

31. The lamina spreader of claim 30, wherein said locking mechanism includes a spring biased finger releasably positioned in a notch formed in said distal portion.

32. A surgical instrument for performing a surgical procedure through a posterior lateral opening in the disc space, comprising:

a proximal portion residing outside the disc space, said proximal portion extending along an axis; and

a distal portion having a distal working end insertable in the disc space, said distal portion having a lateral offset portion, said lateral offset portion including a bend oriented away from axis of said proximal portion and a straight portion extending from said bend generally in the direction of said axis to a distal working end offset from said axis, wherein said distal working end extends further away from said axis in the direction of said bend.

33. The instrument of claim 32, wherein the surgical instrument is a disc space spreader.

34. The instrument of claim 33, wherein said distal working end includes a pair of spreading portions and said proximal portion includes a pair of branches pivotally connected to one another, each of said branches connected with a corresponding one of said spreading portions.

35. The instrument of claim 34, further comprising a spreading mechanism extending between and connected to said branches.

36. The instrument of claim 32, wherein the surgical instrument is an implant inserter and said distal working end includes an implant connector and an implant.

37. The instrument of claim 32, wherein said distal working end includes a pair of guide members and said proximal portion includes a pair of branches pivotally connected to one another, each of said branches connected with a corresponding one of said guide members.

39. A method for inserting an implant in a spinal disc space, comprising:
providing a posterior lateral opening into the disc space;
selecting an implant for insertion into the disc space;
securing a trailing end of an implant to an implant inserter;
positioning a leading end of the implant at the opening;
engaging a pusher to the implant inserter;
applying an impaction force to the implant with the pusher to push the implant through the opening and into the disc space; and
applying a pivoting force to the implant with the implant inserter to move the leading end of the implant towards a distal portion of the disc space.

40. The method of claim 39, further comprising alternating between applying an impaction force and applying a pivoting force.

41. The method of claim 39, further comprising removing disc material from the disc space prior to positioning the leading end of the implant at the opening.

42. The method of claim 39, further comprising forming a square entrance port at the opening prior to positioning the leading end of the implant at the opening.

43. The method of claim 39, further comprising:
positioning the implant at a distal portion of the disc space; and

inserting a second implant into the disc space through the opening after positioning the implant at the distal portion of the disc space.

44. The method of claim 39, further comprising:
inserting an implant template into the disc space prior to selecting the implant.

45. The method of claim 39, further comprising inserting an implant insertion guide into the disc space prior to positioning the leading end of the implant at the opening.

46. A method for preparing a disc space for insertion of an implant between adjacent vertebrae, comprising:
accessing the disc space;
engaging a lamina spreader to the adjacent vertebrae;
spreading the lamina of the adjacent vertebra with the lamina spreader;
forming an opening into the disc space;
inserting a disc space spreader into the disc space; and
spreading the adjacent vertebra until the endplates of the vertebrae are parallel with one another.

47. The method of claim 46, further comprising:
inserting a straight reamer through the opening into the disc space; and
removing material from the proximal portion of the disc space with the straight reamer.

48. The method of claim 47, further comprising:
inserting a curved reamer through the opening into the disc space; and
removing disc material from the distal portion of the disc space with the curved reamer.

49. The method of claim 48, further comprising:

inserting a chisel into the opening;

forming a square entrance port at the opening with the chisel.